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WHAT DRUGGISTS CAN DO TO ASSIST IN DETECTING CASES OF POISONING.

By Henry Leffmann, A.M., M.D.

Death from poisoning is much more common than the mortality statistics indicate. This is due not only to the fact that many poisons produce symptoms that simulate disease, but also to the haste in which diagnosis is made and the rare opportunity to verify it by autopsy. It must, however, be borne in mind that it is to-day impossible, in the light of our present knowledge, to define precisely the boundary between poisoning and disease. All the great masters of medical jurisprudence and toxicology have labored to define the word poison, but none of the definitions will stand criticism, and some of them, like the Spencerian definitions of "life" and "evolution," confuse rather than enlighten the average mind. Of late years, the activity of the authorities in the suppression of food-adulteration has developed a peculiar and unscientific view, and even secured judicial recognition of it, namely, that a given substance is either a poison or not a poison, without reference to the question of dose. It would be apparent to any one familiar with the principles of pharmacology and therapeutics, that dose is one of the most important factors in determining the physiologic action of any substance. To pick out, arbitrarily, such materials as boric acid and sodium benzoate and denounce them as poisons in every proportion, and at the same time declare that saltpeter, acetic acid and vanillin are wholly suitable for addition to food, is one of the startling inconsistencies of certain dairy and food commissioners.

It is not my intention to attempt to instruct druggists in the art of diagnosis or elaborate toxicologic analysis. Each of these is a

science in itself, and skill in it is acquired only by long individual practice. My object is to call attention to some simple tests which are available as means of diagnosis; to some wide-spread errors as to possible causes of disease and poisoning, and to some serious mistakes that are too often made by those who have to do with collecting or forwarding materials for toxicologic examination.

I have just alluded to the difficulty of determining precisely the boundary between poisoning and disease, and this applies as much to the legal as to the purely medical phase of the question. In truth, under our present scientific light, we must classify a very large number of so-called diseases as poisoning. Most of the sudden choleraic seizures, so common in the warmer season—the picnic illnesses, from ice-cream and cream-puffs, for instance—are true irritant poisonings, due to materials produced by excessive microbic growth. Just here I must warn against a much overworked word. A remark by Hobbes, the English philosopher, should be always in the mind of every scientific thinker: "Words are wise men's counters; they do but reckon by them, but they are the money of fools." I refer now to the word "ptomain." This word has a legitimate use, but it has been made to do heavy duty for concealing ignorance and for ornamenting the sensational articles of newspapers.

In large cities of this country, intimate relations are often established between doctors and druggists, the latter performing some of the clinical tests so useful in diagnosis. For such work numerous valuable manuals are available, so that in addition to the recollection of the instruction that the druggist has received in his college course, he can easily find a guide to the methods of these tests. I find, however, that toxicologic tests are usually overlooked. Some of them are as simple and as certain as the usual tests for albumin and sugar. Reinsch's test is one of these. It takes but a few minutes, requires only common materials, and is a very satisfactory indication of the characteristic elements of three common poisons—arsenous oxid, tartar emetic and corrosive sublimate. I think, however, it is as much in its negative as in its positive results that it should be considered.

When poisoning is accompanied by marked corrosive action, as is produced by sulphuric acid, or when the poison has a distinct and well-known odor, as is the case with phenol or chloroform, the

chemical tests are not so important as a means of diagnosis, although, of course, they are the main points in the formal investigation, but when these characteristic actions or odors are wanting, chemical tests will often help. It is true that such tests are rarely prompt enough for immediate diagnosis, but they are useful for suggesting a line of action after the acute conditions have passed. Let us take, for example, the common irritant poisonings to which allusion has just been made. The symptoms developed by a stale cream-puff on an August afternoon may be so violent as to seem to threaten life and to suggest a very active drug. We know, indeed, now, that the effect is probably due to one or more organic bodies, products of the breaking down of proteid matters of microbes. The treatment will, as a rule, be addressed to the symptoms, and no attempt be made at direct antidotal remedies. In truth, I have for some years thought that the formal table of antidotes that is appended to quiz compends, physicians' visiting lists and pocket formularies, has more of a literary than a practical value. A physician called to a case of violent vomiting and purging, of sudden onset, will rely on sedative or supportive remedies and will not consider whether freshly precipitated ferric hydroxid, old oil of turpentine, albumin or tannin should be given. When the symptoms are under control, and opportunity is obtained for some history of the case, the question of possible poisoning will come up. Now, the detection of the so-called ptomains, or of the microbes that produce them, cannot be done by the druggist. It is a problem of the highest difficulty and, if solved at all, it is only by the most expert and best-equipped specialists. Chemical tests come in here as methods of exclusion. In ordinary cases of acute poisoning, attended by marked irritation of the stomach, whether with or without severe burning pain, if you should be asked by a doctor to test any suspected food or vomited matters, apply first Reinsch's test. The material usually requires no preparation. A slip of thin copper-foil about half a square inch in area is boiled in a test-tube or porcelain basin for about half a minute with, say, 10 c.c. of water and 1 c.c. of hydrochloric acid. The slip should remain bright, and will remain so if the chemicals are reasonably pure. After this preliminary test has been made satisfactory, some of the suspected material should be added and the boiling continued for half a minute or so. If the copper acquires a dark stain the presence of some foreign body is

indicated. Further tests are needed to identify this exactly, but I will not describe these. It is sufficient to indicate here that no food article, human tissue, secretion or excretion in normal condition will give with Reinsch's test a distinct stain on copper, and also that very small amounts of arsenous oxid, tartar emetic, corrosive sublimate, calomel and bismuth subnitrate will be detected by it. It may seem a waste of time to discuss here this well-known test. In this audience will be many who know its value and its limitations, and have used it many times, but I know from a long experience with practical toxicologic work in Philadelphia that many doctors and druggists are not aware of the ease and wide usefulness of this test. I have in mind now a case in which a Philadelphia druggist was asked by a doctor to make a test of a sample of coffee which the latter supposed to have been the cause of poisoning. The druggist tested for arsenic by adding a solution of copper sulphate to the sample. A green precipitate was produced, and he decided at once that this was copper arsenite. A poor woman was arrested and detained overnight in the stationhouse. The sample was forwarded to me by the police authorities, and I had no difficulty in showing its entire freedom from metallic poisons, and the prisoner was discharged. A modification of this test was used by me in a case of poisoning by corrosive sublimate, to which I was suddenly called. I placed a drop of the solution (water from a tea-kettle, into which the corrosive sublimate had been dropped), on a gold coin, and held the blade of a knife so as to touch the coin and include the drop on the angle. A spot of amalgam was formed on the gold.

I have noted, however, that certain drugs, which in ordinary doses are not regarded as poisons, may give positive effects with Reinsch's test, and these must always be borne in mind, especially as two of them, calomel and bismuth subnitrate, are very apt to be given in cases of irritation of stomach and bowels. I have never been able to see any particular use for the latter drug except to interfere with toxicologic examinations. We inherit it from our medieval predecessors along with a lot of other useless things—Roman numerals, the English system of weights and measures, blood purifiers and the subjunctive mood.

The negative results with Reinsch's test are often of good value. By its means one is able to eliminate suspicion in many common cases. Upon no topic in toxicology is there more widespread mis-

understanding than the acute cases of food-poisoning in the warmer season. Apart from the newspaper exploitation of ptomains, we find that even intelligent people think that such cases are due to some metallic compounds. Reinsch's test will eliminate many of these. Copper is not infrequently suspected as a cause of poisoning in cream-puffs, and there is a sort of Santa-Claus legend that this agreeable but treacherous dessert is baked in copper pans. How such a practice could introduce enough copper to cause poisoning, even if it were in vogue, it is impossible to tell. Copper-salts are irritants, but when in quantity to cause poisoning would give such a disagreeable taste, and probably so noticeable a color to the mass as to warn any one of the danger. Of course, any properly educated druggist should be able to test for copper in common food-articles; but it must be borne in mind that minute amounts of this element are present in many tissues, and also that contamination may occur from the flame of the gas-burner. Hence, the finding of mere traces of copper will not prove anything from a toxicologic point of view. The reaction with potassium ferrocyanid or with a bright steel needle will be convenient methods of showing copper in objectionable amount.

A very important part of the detection of poisoning and punishment of guilty parties is the proper collection and forwarding of specimens. In large cities the coroner's officers or the police authorities generally take charge, but it is not at all unlikely that in an emergency some one will visit a nearby druggist and get a few jars for specimens. If you have a chance to give advice, do not lose the opportunity to get the different materials put into separate vessels. The ignorance and carelessness that I have encountered in this regard is astonishing. A distinguished pathologist once brought me materials from a postmortem of suspected poisoning, and he had put the liver in with contents of the stomach. Of course, it was then impossible to tell whether the material in the liver had been absorbed from the stomach before death or after death—a point of greatest moment in such a case. Put each organ and material in a separate vessel; use new bottles or jars and rinse them well with ordinary tap-water (this is better than distilled water, for the latter may contain small amounts of some compound derived from the distilling apparatus). I have had specimens sent to me in tomato cans and beer bottles. If it is deemed necessary to use a preserva-

tive, I think that formaldehyde is the best. A few drops of the common 40 per cent. solution placed in each jar will restrain decomposition sufficient for toxicologic purposes. A portion of the solution from the same stock should accompany the specimens in order that the chemist may show that the preservative was not the source of the poison found. Alcohol is not so satisfactory in these cases, as a good deal of it is required, and it may dissolve some materials out of the tissues.

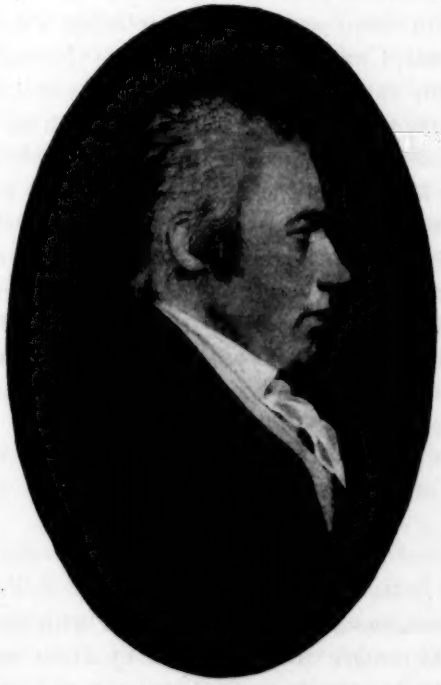
It may be well to add a caution here to those who are not familiar with the methods of the law. "Every man should know a little of law," says Sir Edward Coke, and the author of the "Comic Blackstone," a humorous essay that appeared many years ago in *Punch*, says "the less the better." In the trial of cases of poisoning, the identity of the materials is of prime importance. Hence, all persons who have had the materials at any time in their possession are liable to be called as witnesses. It is therefore wise for a druggist not to allow himself to become a custodian of specimens, unless he is prepared to appear in court to testify to that fact. Moreover, jars containing specimens should be sealed, and it is well to remember that sealing is not accomplished by dabbing a lot of red wax over in different spots. Some marks should be impressed on the wax. The not uncommon expedient of using an ordinary coin for this purpose is a poor plan. Use something that is distinctive. Label each jar and, if possible, write in the glass a letter or number corresponding to a number in an identification list.

It may also be worth while to call attention to some recent advances in the treatment of poisoning. Washing out the stomach with water freely has been shown to be applicable in many cases. The addition of a small amount of potassium permanganate, a few grains to the fluid ounce, is advantageous in poisoning by phosphorus or morphin. The antidotal value of strong alcohol in phenol poisoning is undoubted. It can be used in the internal cases in the form of whisky; in external cases still stronger. A few months ago, I accidentally spilled some concentrated hot phenol over the back of one hand; the white skin formed at once. I quickly poured over my hand about a tablespoonful of strong alcohol. The skin returned at once to a normal color, and except a slight roughness for a few hours was unaffected. Phenol poisoning is now very common.

THE STORY OF A VERY OLD PHILADELPHIA DRUG STORE.

By Evan Tyson Ellis, Ph.G.

There was a drug store in Philadelphia as early as 1729, that we know of, and this is the way it originated. Christopher Marshall, born in Mary Street, Dublin, November 6, 1709, was educated at a college in England. His parents were closely connected with the nobility there, through the families of Cussack, DeLacey, Grenville and Cowley. The father of Christopher Marshall died when



Charles Marshall,
1724–1825.

he was very young, and owing to the fact that he came to America without the consent of his mother, he was disowned by her and never afterward had any communication with his relatives.

He had a classical education and was well versed in Latin and Greek. He took up chemistry and first established himself in business in Philadelphia, at Front and Chestnut Streets, in 1729, but at

the time of his marriage to Sarah Thompson, in 1735, he bought the property afterwards known as No. 56, opposite Strawberry Street (the present number is 214) where his sons, as they became of age, were admitted as partners in the business (drugs, chemicals and paints), Christopher Marshall, Jr., being the first of the sons taken into partnership. Christopher Marshall, the founder, retired from trade in 1772, and was succeeded by his sons, the firm name being Christopher Marshall, Jr. and Charles Marshall. The father died in 1797.

He was a remarkable man and character in his day, and filled many positions of honor and trust in our infant city. I have from his great-grandson, Charles Marshall, now of Germantown, to whom I am indebted for this family data, a list of over a dozen organizations—civic, patriotic and benevolent—of which he was a member. Some, indeed, are in existence at this day, notably the Society for Alleviating the Miseries of the Public Prisons, and the Philadelphia Library. He took an active part in the events which led up to the declaration of our independence, for we find him a signer of the non-importation act of November 7, 1765; a member of the Council of Safety, and one of the escorting party to John Nixon when he read the Declaration, July 8, 1776. He was also one of the original members of the Free Quakers, and to-day can be seen at Arch and Fifth Streets the tablet—

By general subscription
for the Free Quakers
erected A.D. 1783,
of the Empire 8.

For the information of those not familiar with the history of the Friends, I would remark that the Free Quakers were an offshoot from the main body of comparatively a few who felt that they could not maintain the peaceful principles of the Society when it came to a war for our independence. Their active membership did not survive that generation, though if birthright membership would count, as it does with Friends, and as they never disowned any, there would be perhaps 500 to-day. The diary of Christopher Marshall was written after he retired from the drug business, and is an interesting little book of the times, prized by antiquarians and now a rare work.

It would appear that the business was profitable, for his descendant has Christopher Marshall's inventory of his possessions, showing real estate, ground rents and other evidences of wealth. I find from the oldest city directory attainable, that there were, in 1785, twenty apothecaries in the town. They appear to have almost all been located on Market and Second Streets, east of Fourth Street. Townsend Speakman's store was next to the corner of Market and Second Streets. The Marshalls alone were on Chestnut Street, and I cannot call to mind any one of the same name or any successor, except the Marshalls, or perhaps the Wetherills (who are not down in the directory as druggists), who were in business when I entered as apprentice in 1844. In the period from 1775 to 1785 the population of Philadelphia had increased to 40,000.

The sons of Christopher Marshall carried on the business until 1804, Charles having retired as an active member in 1801, and it would seem that they did not confine their energies to the "shop," for we are informed that they were in exports and imports, and were interested in iron furnaces at Deep Creek, and in Nanticoke forges, situated in Sussex, Worcester and Dorchester Counties, Maryland. A newspaper of the period informs the town that a choice assortment of fresh teas had been added to the stock.

Charles Marshall was born 5th Mo., 8th, 1744, and received his pharmaceutical education in his father's establishment. He was well educated, before his apprenticeship, in the branches then taught, including Latin and Greek, and was possessed of a fine literary taste.

A few years after his retirement from active business the establishment with which his name had been associated for many years loaned the endorsement of the firm to a large amount, and involved all connected with it in bankruptcy. The silent partner, who was then in advanced life, was entirely ignorant of these proceedings; but he met the shock with fortitude, and without hesitation gave up all his property for the benefit of his creditors, and changed his manner of living. It was at this juncture that his daughter Elizabeth came to the rescue of the family and assumed the charge of the business.

When the University of Pennsylvania assumed to issue diplomas to practitioners of pharmacy, and to prescribe the conditions of the grant, the pharmacists of Philadelphia felt it to be an infraction of

their rights, and established the Philadelphia College of Pharmacy in 1821. It is proof of the appreciation of the character of Charles Marshall that, although he had been out of business for many years, he was unanimously chosen the first president. Though far advanced in life, and unable to take an active part, he gave the College all his sympathy and support.

The founding of the Philadelphia College of Pharmacy has given a status and character to both branches of the trade in Philadelphia, and extended an influence over the entire country, for the reason that its purpose clearly indicated that those who were instrumental in establishing it sought to place the occupation upon a higher plane and standard of requirement.

Charles Marshall was well qualified to conduct the apothecary business as it was carried on at that time, for it was necessary then to be both botanist and chemist, not only to make the tinctures from drugs which had already been gathered and in store, but to go out into the wood, collect the plants, dry and powder them, and then make the preparations; for there were no laboratories to supply finished products as there are now.

The store had earned an enviable reputation through the exertion of its founder, the first Christopher Marshall, who carried on the business up to the time of the Revolution with credit and success, and all this was increased under the management of the son. Christopher Marshall furnished the medical outfits for the troops of Pennsylvania, New Jersey, Maryland, Delaware and Virginia, as recorded in his account book now with the Historical Society.

Charles Marshall died in 1825, at the age of eighty-one. He is described as 6 feet in stature, of slender mold, clear expression, heightened in his latter years by a profusion of white snowy hair. He was a consistent member of the Society of Friends and was retained after the failure, a thing unusual in those days, when members were disowned right and left for trivial offences; so much so that an historian of the Society remarks that it is a wonder to him that there is any Society left.

As I have mentioned, the daughter of Charles Marshall took charge of the business at the time of the failure of her father; this was in 1804. Elizabeth Marshall was a woman of singular good sense and varied attainments. The maiden pharmacist presided over the establishment with dignity and skill, aided of course at

first by her father, and under her judicious management there was restored to the family a liberal competence. In after years the able senior apprentices relieved her of most of the responsibilty. Many of the leading physicians and citizens, sympathizing with the calamity that had overtaken the family, and knowing the worth and integrity of the venerable Charles Marshall, lent their influence to promote her laudable endeavors. The gradual but sure extension of the business followed. The premises were enlarged to meet the increase; a laboratory, an ice-house and a warehouse were added, and from the ample stock many country doctors obtained their supplies of genuine drugs and medicines. The number of apprentices ranged from six to twelve.

The building on Chestnut Street is described as being two stories high, with a gable roof projection, from which was suspended a large gilt ball, the sign by which the store was designated, as was the custom in those days. There was a garden back with other buildings, and also buildings on the east, fronting on Vidalls Court, which ran to Second Street as it is to-day.

Elizabeth Marshall continued the business until 1825, when it was delivered over with the real estate to her apprentices, Charles Ellis and Isaac P. Morris. This excellent lady died in 1836, making Charles Ellis and Frederick Brown the trustees and executors of her estate for her remaining sister, Mary Ann Marshall, who survived both. I have a distinct recollection of Elizabeth Marshall as a lady of decided character, affable, courteous, well calculated to command respect, and possessed of excellent character.

It was into this shop, with its dignified maiden pharmacist at the head, that Charles Ellis, my revered father, entered on his career. Hé was born at Muncy, Lycoming County, Pa., in the year 1800, and received a liberal education in an institution at Manhattanville, N. Y. At the age of seventeen he entered on his apprenticeship to Elizabeth Marshall.

Our ancestor, Thomas Ellis, came over with William Penn. He was one of his three trusted counsellors, and held the highest position in the province and in the Society of Friends. He was eminently a religious character, for the records of the meeting at the time of his death show the deep appreciation of his fellow members.

It was not long before Charles Ellis, by dint of industry, perseverance, and the exercise of those qualities which make the phar-

macist honored, respected, and successful, was called upon, with his fellow apprentice, Frederick Brown, to take almost the entire charge of the business. Seldom has a drug store been favored with such a class of young men as apprentices. I call to mind the names of Dillwyn Parrish, after at Eighth and Arch, and President of the College of Pharmacy; Frederick Brown, at Fifth and Chestnut; Samuel P. Griffith, at Eighth and Chestnut, who as a great volunteer fireman lost his life; Joseph Morris, afterward in a large wholesale business at Louisville, Ky.; Isaac P. Morris, Mordecai Gordon, and Paschall Morris.

The firm of Ellis & Morris did not last over five years. Isaac P. Morris then had an opportunity of engaging in the Morris family occupation, the iron industry, from which in a few years came the great I. P. Morris Works, at Richmond, now part of Cramp's immense yards and shops.

In 1832 Charles Ellis associated with him his nephew, William Ellis, who had been an apprentice of Ellis & Morris, and like my father, was born at Muncy, Pa. The name of the firm was Charles Ellis & Co.

In this year, 1832, there came along a Yankee, named Holmes, who placed granite fronts on Nos. 56 and 58 Chestnut Street, which at that time was thought something very fine. Some of Holmes' fronts can still (1903) be seen at Nos. 200 and 204 Chestnut Street; and this is what is said in Caspar Souder's Series on Chestnut Street, published in 1858: "No. 214 (old 56) was a handsome Pictou stone-fronted building, resting on iron columns at the first story. There is much of interest attached to this spot. The first building occupying this site was as I have described it, and was demolished in 1832; then the first granite front ever put up in Philadelphia was erected there. This in turn became old-fashioned and the present handsome iron building supplanted it in 1857. Upon this spot stood the famous Marshall drug store, which for nearly a century had furnished half the town with paregoric."

A large four-story brick warehouse had been erected on the rear street (then Carter's Alley, now Ionic Street), and some of the garden was preserved until about 1840, when the front and rear buildings were connected, first on the main floor only, but subsequently on all the floors.

Speaking of Charles Ellis at the time of his commencement in

business, Dr. Caspar Morris, in his "Tribute," says: "The faithful accuracy with which prescriptions were compounded, and the intelligent effort to secure drugs of the first quality, which had earned for the establishment its deserved eminence, were now, if possible, increased; and the country physicians seeking their supplies from the stock, which commanded the confidence of their city brethren, a wholesale drug business grew up naturally, as the result of faithful attention to the retail branch. It is impossible to place too high an estimate on the influence exerted by Charles Ellis, not only on his own profession, but on the community at large. No one but the physician can appreciate the anxiety with which he investigates the nature of disease and prescribes the appropriate remedy. With prudent caution the symbols of the required dose and the directions for the proper combinations are placed upon the paper, but the effect produced depends on the quality of the articles employed, the care with which the quantities are measured or weighed, and the skill with which they are compounded. Life or death hangs in the balance. The character of Charles Ellis on these points stood unquestioned."

About this period (1825–30), it may be said that Philadelphia was the commercial centre of the drug trade, as of all other kinds of trade in the United States. The houses then established were importers to a very considerable extent.

About old things and furniture: I can remember as a child a lot of mystical, urn-shaped jars on the top shelves marked "Confect.," "Theriac," "Confect. Damocratis," etc., as some of you no doubt saw at the recent (1902) American Pharmaceutical Meeting exhibition; but there never was such in my time, for old things were discarded as new ones came into play; and when we left Chestnut Street in 1857, we placed an entire new up-to-date outfit on the shelves, and no doubt gave the old to some one starting out. There was a solid marble mortar that remained, 25 to 30 gallons capacity, which was one of the most useful things around the laboratory. I never saw another like it.

"The establishment at 56 Chestnut Street was renowned for the extent and integrity of its transactions," says Dr. Morris. "Numbers of members of the College have received their pharmaceutical education within its walls; some still survive, and may cherish pleasant and grateful recollections of the time spent in acquiring a

knowledge of their profession. The firm furnished the tickets and all the young men were required to attend the lectures of the College of Pharmacy."

In 1844, the writer, having graduated at Haverford College, entered on his apprenticeship, and also having graduated in the College of Pharmacy in 1847, was, in 1850, given an interest in the business. The story of our house, as of any contemporary from now on, is more or less one of the drug business as it was then. We were emerging from the retail to the wholesale, though for years there was more or less of the former done, as there were old inhabitants left, who could not believe that things were quite as good elsewhere as those found at Marshall's.

About this time there came a man to us, who had a store in Kensington, but was not satisfied with the small exactions of the counter trade in his vicinity. What Zeitler's antecedents were I never knew. It was reported that he had at one time been associated with a founder of one of the two large manufacturing chemists in Philadelphia, but he never would speak of it in any way, and it was inferred that there had been some difference between them; but he came to us unsolicited, and wanted a very modest salary. We had, up to that time, made all the pharmaceutical preparations used in the business, and a few, as fluid extract of sarsaparilla compound and buchu compound on a small manufacturer's scale. But Zeitler was a born chemist, and could turn out the most perfect salts, somehow, by an intuitive faculty, for he had a contempt for books. "The books," he used to say, "they know nothing," and some old fellow apprentice, who may see this, will smile at what we used to term the Q.S., or Zeitler's system; but he certainly was well informed in chemical reactions. The tinctures, syrups, ointments, etc., were always made in the store; but those apprentices who desired it were given a term with Zeitler in the laboratory.

Now, about this laboratory building: It was a detached building on Vidalls Court, to the east of the main store, with a history; for it had been in its day a hall where entertainments were held and lectures delivered. According to Souder (history of Chestnut Street), a Dr. Chouet had, in 1774, an anatomical museum in this building, which must have been something remarkable at that time, for he says that "Richard Penn, the proprietary Governor, with Dr. Rush, Messrs. Rittenhouse, Dickinson, Mifflin, and other prominent men

of the day, walked up that (now narrow) alley to hear the introductory lecture. The collection remained there until 1777, and now (1858) comprises a valuable part of the museum of the Pennsylvania Hospital." I have heard, in my time, from those who were there, of a popular course delivered by the first Dr. Parrish at a time when our citizens could enjoy a discourse on dry bones. It was the schoolroom in Dr. Mitchell's book, where Hugh Wynne received such a flogging at the hands of his master, David Dove, and the master in return such a scoring from Hugh Wynne's father. We fitted it up with a steam boiler in the cellar, jacketted copper pans, stills, a press, and in fact all the equipment of a pharmaceutical laboratory as known at that time. Numbers of open furnaces for divers operations were around, and there were drying-rooms on the second floor.

And this was the entry of Charles Ellis & Co. on the market as regular pharmaceutical manufacturing chemists, and our preparations in after years obtained a wide reputation and sales all over the United States. Large quantities of medicinal solid extracts then much in use were turned out. I call to mind particularly, "Ext. Sarap. Comp.," and "Ext. Coloc. Comp." The list soon filled a letter-sheet double column.

Several things were attempted at Zeitler's suggestion, as morphia and even quinia, but the limited space did not seem to warrant our going into them. Spread adhesive plaster had always been a specialty with my father. I suppose it came down from the Marshalls, for Samuel P. Griffiths had another machine at Eighth and Chestnut Streets, and that machine, after it had been in the possession of Samuel C. Sheppard and Rushton of New York, fell into the hands of Charles Shivers, who so perfected its work that the beautiful unrivaled spread plaster of Shivers is made to-day by his son. The original machine was a very primitive affair as I call it to mind in the 30's; but after Isaac P. Morris was established at Richmond, there was constructed at his works a very elaborate one. No doubt Isaac gave some of his drug experience of the trials and difficulties of the original. I remember in my childhood the spreading as conducted in the open air, the cloth being pulled by hand clear down Vidalls Court to Second Street, all hands supporting it with broom-handles, etc., and then it was cut into lengths of 5 yards and taken into the store; the whole spreading was not more

than 60 or 75 yards. After the new machine was built and installed in the warehouse, the spread plaster was reeled on drums, and the spreading ran from 1,500 to 2,000 yards at one time. The plaster itself was made on the premises and pulled as candy is, to make it whiter.

At this period there were comparatively few patent medicines—not one perhaps where there are 100 to-day; and it was also the habit with families to purchase drugs in their crude, or original state, and prepare from them the various compounds known as domestic remedies. As to patent medicines, the public, especially the rustic community, had most of their ailments satisfied with a lot of old English things, whose proprietary rights had run out or somehow they had become public property, and they apparently covered the ground. If any one of you think the modern quack audacious in advertising his wares, I would have you read the original English wrappers that came with all these, and which some druggists adhered to; but such was the immense sale, that our College deemed it proper to edit and publish for the trade a modest statement of what was claimed as compared with the original, for each remedy, and also gave formulæ for their preparation. Here they are: Godfrey's Cordial, Bateman's Drops, Dalby's Carminative, Harlem Oil (a vile concoction); and so large was the sale of such things that it constituted the greater portion of the business of many of the wholesale druggists of the 30's and 40's, and their apprentices (as one who came to us after he had served two years said) knew nothing else than putting up these, supplemented with filling vials of laudanum, castor oil, etc. This apprentice became afterwards one of our very prominent citizens in all reform movements and died in 1902.

In 1850, Charles Zeitler left us; he would never ride, and the long walk to and fro was trying, with all his work, to one of his advanced years. He was also induced to manufacture things at his home by one of our prominent chemists, and the last time I saw him, he had a lot of open furnaces and pans in a shed at his home on Frankford Road, where he was making lactates. He died many years ago.

Our firm then obtained a lease on a large lot at Sixth and Morris Streets, where a stone building was erected, to which all the apparatus of the Vidall Court was moved, supplemented with a great

deal more, including steam power to stir the extracts, also to grind and powder drugs; and there the manufacture of pharmaceutical preparations was carried on on a large scale. The writer gave much of his personal attention to this department; and we had also, from time to time, experienced pharmaceutical chemists as superintendents, Dr. Henry C. Archibald, Ph.G. (1867) holding this position from 1866 to 1873.

The laboratory continued in this location until 1868. A number of articles were added to the list, such as blue mass, which I found could be made so as to keep its consistence in all climates, and that gave us quite a run in the South, the then great consumer of mercurials. Citrate of magnesia was mostly made at the store, and it was incomprehensible to me that we had such a demand for it, as there was no mystery about its preparation; some years as high as 1,500 gross were turned out. In the 40's and 50's there was a branch of trade carried on in Philadelphia that has entirely disappeared; it was the dry-goods commission, a go-between from manufacturer to the jobber, and it was a profitable business.

These houses had mostly been located on Front Street, but all at once they took a notion to come into Chestnut Street, and values of property enhanced so much on Chestnut Street that we moved into Market Street, No. 724. The whole lot, including the old buildings on Vidall Court, was then covered with a five-story structure as it is to-day; and has been occupied by dry-goods people ever since, to this time, 1903.

We continued at 724 Market until 1863, when we made a division in our firm. My father, a brother-in-law, William M. Ellicott, Jr., who had come to us from Baltimore in 1861, and myself, constituted the firm of Charles Ellis, Son & Co., and took the store at the northeast corner of Market and Seventh Streets, retaining the laboratory at Sixth and Morris, while the other member of the old firm, William Ellis, remained at 724 Market Street, retiring some years after.

This was war-time, and trade was very active; every old thing was salable in the way of drugs. As members of the Society of Friends we could not accept contracts for army supplies that were often offered us, much to the amazement of the army people, who could not understand Friends' principles; but after war had done its terrible work, we could give to the relief association for the

wounded, which we were glad to do. It was during this period that Professor Joseph P. Remington served his regular four years' apprenticeship with us, graduating in 1866, and has, as we all know, attained since a world-wide reputation as a master in pharmacy, devoting his energies to his alma mater and to the literature of his profession.

The building at Market and Tenth Streets was erected by my father expressly for our business, and soon after the laboratory was accommodated there in the extensive basements, which ran also under the pavements of the streets, while some branches were in the upper floors.

An agreeable feature of our business was the very pleasant personal relations we had with our customers and those with whom we had dealings. Our Boston friends, particularly, appreciated reciprocal dealings, so that our preparations obtained quite a sale through New England.

Charles Ellis virtually retired about this time, though no official notice was published until 1871, when the firm retained the same name. In 1873 Wm. M. Ellicott, Jr., also withdrew and Wellington H. Boyle was associated, the firm being Charles Ellis' Son & Co.

Of William M. Ellicott, Jr., our old apprentices and customers will call to mind his kind, pleasing manner and conscientious devotion to his duties, which were mostly confined to the counting-room. He died in 1884, three days after his wife's death, literally of a broken heart.

Wellington H. Boyle was engaged with the old firm in the 40's down in Chestnut Street, first as an accountant; but as his intercourse with our customers extended, it was found that his usefulness was in the front of the store, where he became proficient in every branch of the sales department. He was without doubt one of the most popular salesmen in the city drug trade of the day, and never had employers more efficient service or a man more devoted to their interests. His manner was pleasing and his whole deportment inspired justly the confidence of our customers. He was born in the north of Ireland, a Protestant, was convinced of the principles of the Society of Friends before he came to us, and was a life-long consistent member. He retired to his farm at Muncy, Pa., and died in 1891, at the age of 78.

Charles Ellis died 5th Mo., 16th, 1874, aged 74 years and 4

months. Dr. Morris in his "Tribute," before referred to, says this of him: "In 1821 the Philadelphia College of Pharmacy was founded, and from that date did Charles Ellis not only take interest, but actively labored for its advancement. During the first few years of its existence, when it was scarcely more than a name, he was always found at his post ready to do his part. Though one of the original sixty-eight members of the College, at the time of his death he left

CHARLES ELLIS,
1800–1874.

but three living, and now all have been gone some years since. It will be seen by a consultation of the minutes of the College that he was an active member of the College for over half a century, over forty years of which was spent in an official capacity. For fifteen years he was President of the College. The files of the JOURNAL reveal numbers of contributions from his pen, and he served for forty years as one of the members of the Publishing Committee, the greater part of the time holding the position of treasurer. This

office was one that was beset with difficulties, and during this long period of forty years his services were rendered gratuitously. The labor involved in keeping the accounts, distributing the JOURNAL, making the collections, etc., was of no light character, an instance of long disinterested service rarely met with in the annals of journalism. In latter years Wellington H. Boyle assisted my father to a great extent.

At the first inception of the American Pharmaceutical Association, which was at a meeting held in New York in 1851 to obtain legislation that resulted in the enactment of Drug Inspection Law, Charles Ellis was one of the three from Philadelphia, William Procter and Alfred B. Taylor being the others. He was a life-long devoted member of the Association and president at the meeting held in Philadelphia in 1857.

"In early life he was often solicited, by his fellow citizens and neighbors, to take part in the affairs of civic government; but a sensitive nature like his shrank from political associations, and found more congenial employment in works of benevolence and charity. There is enumerated in the "Tribute" the meetings and resolutions of no less than twelve different corporations and associations, most of them of a benevolent order; and thus mourned by all who knew him, and most intensely by those who best knew him, Charles Ellis closed his earthly career. He sought not human applause, but in the quiet, unostentatious, diligent performance of his daily duties acquired the esteem, respect and confidence of his friends, acquaintances and fellow citizens."

In this, a necessarily limited retrospect of the history of a drug business, as it existed in Philadelphia from the middle of the eighteenth to the middle of the nineteenth century, there are recalled to the recollection of some who can distinctly remember, the decade periods from 1840 to 1860, many interesting facts in this connection. The personalities of those who were most prominently identified with the earlier periods are still remembered by the few that still survive, and who are themselves declining in the vale of years.

That which becomes memory only, of individuals and events, has had thrown around it by the lapse of time a halo of interest which affords much pleasure and information; and that this feeling should be, if possible, transmitted to and shared by such as now labor in

the same department, is one of the chief objects of a faithfully recorded history.

The house, with its original founder and his successors, was conducted in prosperity for 146 years, which would be a continued existence for four generations, in itself a remarkable history, showing evidence of an unchanging purpose. It terminated May 1, 1875.

In presenting this, the "Story of an Old Philadelphia Drug House," I would remark that I had been asked repeatedly in latter years to compile something of our old drug house by former appren tices.

As time went on—and I feel there is not much left of it for me—and no one else would be likely to do it, I have in a brief manner stated historical facts.

Referring to the "Tribute" to my father to which allusion is made and some of the text used, my idea is to record, as Dr. Morris did in my father's case, matters for the information of those who might feel an interest, among my own family and contemporary druggists now living, and particularly for any old apprentices who can be reached; for there is much of it that can only be appreciated by druggists.

The "Tribute" referred to was compiled in 1875, by Dr. Caspar Morris, at the request of my father's widow, Mary L. Ellis, who wished the expressions of the different organizations, together with a sketch of his life, placed in form for preservation, in order that his grandchildren (some of whom were not born at the time of his death) would know of the character and worth of my father. These were published and were all distributed in the family. It is now out of print.

SYRUP OF FERROUS IODIDE.

By Harry Matusow, Ph.G.

The unstable character of syrup of ferrous iodide is well known. It has been a subject of investigation for many years, and a number of investigators have suggested various methods and formulas with the end in view of overcoming that difficulty.

The use of hypophosphorous acid, which the writer wishes to suggest and advocate as a means of permanently preserving the syrup of ferrous iodide, is not at all new; and the writer's only excuse for

bringing up the subject is a desire to relate his personal experience with it, and, if possible, have its excellent properties of preserving syrup of ferrous iodide made more widely known and its use adopted.

Before entering upon a discussion of the merits of hypophosphorous acid as a preservative of syrup of ferrous iodide, the writer wishes to state, that syrup of ferrous iodide, when carefully prepared and kept in small bottles completely filled, and stoppered with paraffined corks, will keep indefinitely, whether it be kept in the sunlight or in the dark.

Some years ago, a quantity of syrup of ferrous iodide was prepared and transferred to 1-ounce bottles, each of which was wrapped in newspaper and the whole packed in an empty cigar-box, which was then placed in the stairway leading to the cellar. When the last of the lot was used, which was then eight months old, it was in as good condition as when first made. This, no doubt, accounts for the contradictory results obtained by different experimenters with such preservatives as glucose, tartaric acid and citric acid. These substances will preserve the syrup, if the above-given conditions of keeping be observed; but, if those conditions be observed, the use of glucose, tartaric acid and citric acid is superfluous; if they be not observed, the use of these preservatives seems to be useless. Mr. W. H. Pile, in the "Proceedings of the American Pharmaceutical Association," for the year 1877, reports his experience with citric acid as follows: "I have made comparative trials with and without the addition of citric acid, and several times during the year, but from some unknown cause, or want of skill on my part, I have not yet succeeded in making a syrup unchangeable in appearance by the addition of citric acid, as recommended, unless the syrup thus prepared was kept in full vials and sealed; but in this way no addition appears to be necessary."

The sample of syrup of ferrous iodide here exhibited is the balance of an 8-ounce lot of syrup prepared on the eighth day of August, this year; it is therefore over four months olds. The syrup was prepared according to the U. S. Pharmacopœial formula and directions, with the exception that 1 fluid dram of diluted hypophosphorous acid (10 per cent.) was added to 8 fluid ounces of the finished syrup, and instead of storing it in small, well-stoppered and completely filled bottles, as directed, the whole quantity was transferred

to an 8-ounce bottle and stoppered with an ordinary unprotected cork. Since the time of its preparation, the syrup has been frequently used and the bottle containing it repeatedly opened for the sake of experiment.

The syrup was not exposed to direct sunlight; it was simply placed aside where it would be least in the way—on the uppermost of a series of shelves, located on one side of a space about 3 x 3 feet, between the store and the adjacent room in the rear. The result, as you see, is all that could be desired.

The slight coloration which you notice in the syrup is undoubtedly due to the action of the syrup upon the unprotected cork, and not to free iodine. A month ago the writer had occasion to carry this bottle of syrup in his pocket, when it was subjected to rather severe agitation; on removing the bottle from the pocket it was found, to the writer's dismay, that it had assumed this shade of color. However, that was good warning, and the cork was at once replaced with one that was thoroughly paraffined.

That no free iodine is present in the syrup is shown by the negative results obtained on applying starch T.S. That the amount of hypophosphorous acid present in this sample does not interfere with the starch-iodine reaction is evidenced by the fact, that on adding a trace of iodine to the mixture of syrup and starch T.S. the characteristic blue color is at once displayed. To further prove that the amount of hypophosphorous acid present in this sample does not interfere with the starch-iodine reaction, some simple syrup was mixed with hypophosphorous acid in the proportion of 8 fluid ounces of the former to 1 fluid dram of the latter; enough of a weak solution of iodine in potassium iodide and water was then added to this mixture to impart to it a color corresponding to the one possessed by the sample of syrup of ferrous iodide here exhibited. Upon the addition of starch T.S. to this prepared mixture the presence of free iodine was immediately revealed.

The first person on record, so far as the writer was able to find, to suggest the use of hypophosphorous acid in connection with syrup of ferrous iodide is Prof. J. F. Judge, of Cincinnati, O. In a paper read before the Cincinnati College of Pharmacy in 1876 (AMER. JOUR. PHARM., 1876, p. 158) Professor Judge recommended, as a result of his experiments, the use of hypophosphorous acid as a means of restoring discolored syrup of ferrous iodide, in preference

to sodium hyposulphite (sodium thiosulphate), which, while effective in removing the free iodine, is objectionable on account of the precipitation of sulphur which takes place in the reaction, viz.: $Na_2S_2O_3+H_2O+I_2=Na_2SO_4+2HI+S$. Professor Judge directs the addition of nails or wire to the syrup restored by means of hypophosphorous acid in order to neutralize the hydriodic acid formed.

Nine years later, in 1885 ("Year-book of Pharmacy," 1885, p. 484) Mr. A. E. Robinson, F.C.S., at the British Pharmaceutical Conference, held at Aberdeen, Scotland, presented a very interesting and able paper by the title of "Permanent Solution of Ferrous Iodide," in which he claims the discovery of hypophosphorous acid as a preservative of ferrous iodide, while, as stated above, the credit of discovery really belongs to our own countryman, Prof. J. F. Judge.

Mr. Robinson, after a discussion of the various methods used at different times to preserve syrup of ferrous iodide, suggested the use of hypophosphorous acid as the most effective and desirable means to obtain that end. Mr. Robinson, however, believing that on keeping, the decomposition of the syrup takes place with the formation of grape-sugar, suggested a formula for an aqueous solution of ferrous iodide, preserved by means of hypophosphorous acid. The formula, suggested by Mr. Robinson, is as follows:

Take of

Iodine	1,804 grs.
Iron wire	2 ozs.
Distilled water	6 fl. ozs.
Hypophosphorous acid (20 per cent.)	3 fl. drams.

Digest the iodine, iron wire and water, at a gentle heat, until combination is complete; then filter into the hypophosphorous acid and add sufficient water to make 8 fluid ounces.

Prof. J. M. Good, at a meeting of the Missouri Pharmaceutical Association, in 1891, stated that syrup of ferrous iodide made from the National Formulary solution of ferrous iodide, in which hypophosphorous acid is used, manifests no disposition to change. This cannot be said of the official syrup.

Mr. E. A. Warren (*Pharmaceutical Record*, 1892) recommends the addition of 2 fluid drams of hypophosphorous acid to the pint of syrup of ferrous iodide. Mr. Warren filters the solution of ferrous iodide into the hypophosphorous acid.

Mr. A. Bradley, at a meeting of the North Carolina Pharmaceutical Association, in 1893, recommended the addition of three fluid drams of hypophosphorous acid, 10 per cent., to 1 pint of syrup of ferrous iodide. Mr. Bradley adds the hypophosphorous acid to the finished syrup.

Mr. C. Levy (*American Druggist and Pharmaceutical Record*, 1894) recommended the addition of hypophosphorous acid to the solution of ferrous iodide to prevent oxidation, and which, he says, is not objectionable from a therapeutic point of view. Mr. Levy uses 8 grammes of 10 per cent. hypophosphorous acid to 750 grammes of a 20 per cent. solution of ferous iodide.

The editor of the *Pharmaceutical Journal* (*Pharm. Journal*, March 14, 1896) in a series of criticisms and suggestions respecting the syrups of the British Pharmacopœia, suggested the addition of 40 minims of hypophosphorous acid to 2 pounds and 10 ounces of the finished syrup, the hypophosphorous acid being added to the solution of ferrous iodide before adding the syrup.

Dr. A. R. L. Dohme, in a report to the Maryland Pharmaceutical Association, in 1897, proposed a formula for syrup of ferrous iodide in which 5 c.c. of 50 per cent. hypophosphorous acid are used to preserve 1,000 c.c. of the syrup.

In 1900, Mr. Haussmann (Am. Jour. Pharm., 1900, p. 216) proposed a modification of the formula suggested by Dr. Dohme, namely, reducing the quantity of sugar from 850 grammes to 600 grammes and the substitution of 20 c.c. of the diluted hypophosphorous acid of the U.S.P. (10 per cent.) for the 5 c.c. of the 50 per cent. acid.

Mr. F. W. Haussmann (Am. Jour. Pharm., 1901, p. 17) claims that "the discoloration of the syrup of ferrous iodide on keeping is mainly due to caramelization of the sugar; in exceptional cases only to the oxidation of the ferrous salt. In an examination of some fifteen discolored samples not one reacted for the presence of ferric compounds." The interesting question here is, if the discoloration is due to caramelization, why does not the discoloration take place immediately on preparing the syrup, as the caramelization would, no doubt, be caused by the heat employed in preparing the syrup and not by old age. The fact that Mr. Haussmann did not find any ferric salts in the samples of discolored syrup examined by him, would indicate, also, the absence of free iodine in those samples; for

how can we conceive of the formation of free iodine in syrup of ferrous iodide without the simultaneous production of a ferric compound? We know that the iodine in syrup of ferrous iodide is liberated according to the following reaction:

$$2FeI_2 + O_3 = Fe_2O_3 + 2I_2.$$

Of course, there may be some intermediate compounds formed, but this no doubt is the final reaction.

Every sample of discolored syrup of ferrous iodide that has come under the observation of the writer, he was able to restore to its original color. Now, if the discoloration were due to caramelization how can we account for this phenomenon? The writer has also found ferric compounds present in every sample of syrup examined, by applying potassium sulphocyanate T.S. and shaking with ether, when the characteristic deep-red color was taken up by the ethereal layer. In every case, the potassium sulphocyanate T.S. and the ether were first introduced into the test-tube and shaken, before the addition of the syrup, to make certain that no trace of a ferric compound was present in the test-tube, which would give a reaction for ferric iron when none might be present in the syrup.

That caramelization takes place to some extent occasionally, is quite possible; but that it is the cause of the discoloration of syrup of ferrous iodide in most cases does not seem probable.

As to the relative merits of the different preservatives suggested, we should note that thus far all methods and means suggested as preservatives of syrup of ferrous iodide, with the single exception of hypophosphorous acid, while they have proven successful in the hands of some, have absolutely failed in the hands of others. Hypophosphorous acid seems to be the only substance to hold undisputed ground as an effective preservative of syrup of ferrous iodide.

As to the presence of hypophosphorous acid in syrup of ferrous iodide, from a therapeutic viewpoint, the writer should like to ask which of the two conditions is the preferable one: To have a syrup with a small quantity of hypophosphorous acid, or one which has been discolored and contains free iodine, with the accompanying risk of producing iodism, one case of which has come under the writer's observation.

In the writer's opinion the first condition is surely the preferable one. The physiological effect of free iodine we need not

discuss, for when a physician prescribes syrup of ferrous iodide he does not want free iodine; if he should, he has the official compound solution of iodine, which he can make use of and which contains a definite amount of free iodine.

When we consider the amount of hypophosphorous acid consumed in the form of its various salts, present in the much-lauded compound syrups of hypophosphites, emulsions of cod-liver oil with hypophosphites, etc., and which are recommended as great nerve and brain foods, its presence, in trifling quantity, in the syrup of ferrous iodide should cause no alarm, nor should it raise any objections on the part of the physician.

WHY POPCORN POPS.

By M. I. Wilbert,
Apothecary at the German Hospital, Philadelphia.

Why popcorn should have the peculiar property of being readily converted, from a hard, dense, flinty kernel to a deliciously mealy morsel, by the simple application of heat, is a question that has probably suggested itself to every thinking individual that has ever held a popper of popcorn over a bed of hot coals.

While this question has, no doubt, been answered a number of times, I myself have never found any satisfactory explanation of the phenomenon, either from books of reference on general subjects, or from inquiries made of a number of individuals who might be supposed to know.

A chance clipping from one of the daily papers, in which popcorn was recommended as a most desirable food-product, appeared to contain a possible key to the problem.

The explanation given in this particular clipping was, that "popcorn being corn with an excess of water in it, and surrounded by a tough envelope that retains the water, may be heated over a fire until the contained moisture is converted into steam under pressure. When the skin cannot longer resist the pressure of the steam within it bursts and the corn is fit to eat."

This appears to offer a feasible explanation of the phenomenon, with the single exception, that instead of supposing each kernel to be a mass of corn, or cornstarch and water, enveloped in a hard

shell, we must suppose that each individual cell is a miniature sealed container, the walls of which are sufficiently dense to retain the contained moisture, until the same has been converted into steam under pressure. If the residual moisture is sufficient and the conversion into steam is uniform and rapid, the greater number of the cells of which the kernel is composed will be exploded and the result will be a large, dry, mealy mass of converted cornstarch. If the corn is old and dry it will at best only split open from a number of cells near the centre of the corn kernel. If the application of heat be made slowly it is possible to dry the kernels of corn, parch and even char them without rupturing the outer coat in any way.

Another interesting feature of popcorn may be found in the fact, that at the base of the kernels, or at the point of attachment to the cob, the cells are less compact and are seldom if ever ruptured by the generated steam. It is from this point too that the kernels of corn appear to dry most rapidly.

This latter fact would appear to explain the reason why popcorn is always preserved on the cob and never shelled, as is ordinary fodder corn.

One feature that appears to bear out the theory of explosion by steam is the fact that popcorn invariably bursts first at the densest portion of the kernel, and never at or near its base or point of attachment.

A series of experiments that were made appear to demonstrate the fact that popcorn loses considerably in weight by being heated. Using corn from the same cob, it was found that the weight of the kernels at the several stages was as follows:

Whole or unpopped corn, 100 grains weighed 13·00 grammes.

Partially popped corn, 100 grains weighed 11·00 grammes.

Fully popped corn, 100 grains weighed 9·20 grammes.

Dried and parched corn, 100 grains weighed 7·50 grammes.

The corn that was used in these experiments was rather old and dry; the resulting popcorn was decidedly tough and not very light. An attempt was then made to see if it were possible to improve the corn by moistening. A cob of approximately the same size as the one used in the experiments noted above was soaked in water for twelve hours, then allowed to dry for twelve hours. When the corn was shelled it was found to be still moist. An attempt to pop this corn was not very successful, many of the kernels being only cracked

open. It was noted, however, that the resulting kernels were not so tough as the ordinary dry popcorn kernels that had been popped at the same degree.

Allowing these kernels to dry on the surface for another twenty-four hours, and then popping, gave us a very pleasant surprise, in that the resulting kernels of popped corn were not only very large, light and flaky, but had absolutely no suggestion of toughness when first popped.

In this connection it would be interesting to know more of the damage done to the cell-structures, and also to determine the amount of soluble material produced by the change in the starch.

TEA.

By Wm. B. Marshall.

I. BOTANY.

At the present day it is pretty well established that there is only one species of tea, viz., *Thea sinensis, L.* In the second edition of Species Plantarum, Linnæus divided *T. sinensis* into two species: *T. bohea* and *T. viridis*, the former to include the plants from which the black teas are made and the latter the plants from which the green teas are made. Other authors have described other supposed species. All of these are now referred to *T. sinensis*. If there be any differences they are at best merely varietal and are most likely due to changes effected by ages of cultivation and selection. Robert Fortune found that in the Canton district, which prepares black tea only, *T. bohea* is grown; in the Chekiang district, which prepares green tea only, *T. viridis* is grown; but in the Fokien district, which prepares black tea only, *T. viridis* is the variety commonly cultivated. Until recently *Thea* and its close ally *Camellia* were placed in the order Ternstrœmiaceæ but are now placed in a separate order named Theaceæ. The tea is important for its leaf. The Camellias are important for their floral beauty; several species, especially *Camellia oleifera*, are extensively cultivated for the seeds, which yield, upon boiling, tea oil resembling olive oil and similarly used in China; and one species yields Sasanqua tea, and its flowers, for which it is chiefly cultivated, are used to flavor some kinds of the true tea.

II. THE PLANT.

In its natural state the plant is a tree from 20 to 30 feet high, but under cultivation it is made to remain a shrub from 3 to 6 feet high. The leaves are from 2 to 6 inches long, evergreen, lanceolate, serrated throughout nearly the whole margin, distinctly petioled, and arranged alternately. The flowers are somewhat smaller than apple blossoms, which they resemble in a general way. They have a persistent five-parted calyx, six to nine pure white petals, and a great number of stamens. They are very fragrant. They occur singly or in groups of two or three, in the axils of the leaves. The plant is frequently grown in our gardens and greenhouses, because of the beauty of its foliage and flowers, and the interest attaching to it as a plant of the first economic importance. The seeds, of which each flower should produce three, are nearly spherical, about as large as a small hazel nut, hard, dark brown or nearly black, and enclosed in a horny capsule. The fruit itself resembles three small marbles, each touching the other two and all three sharing a tight-fitting jacket which tones down the interspaces but conceals little of the form of each little sphere within. It hangs by a short stem. In dropping the seeds the capsule opens at three places from the stem downward, each sphere having one opening across (up and down) its outermost surface.

III. GEOGRAPHY AND HISTORY.

As in the case of many other plants which came under cultivation thousands of years ago, the exact locality in which the tea plant originated is doubtful. But that it originated somewhere in Southeastern Asia is certain, and that has and probably always will be its chief home. One author has expressed the opinion that the island of Hainan, lying off the south coast of China, between the Yellow Sea and the Gulf of Tonquin, is the native habitat; while others think that various parts of Eastern China are entitled to the distinction. Most plants in the wild state, especially those of a hardy nature, are not, as a rule, confined to a small area, but have an extended range. It seems reasonable to infer from this that the tea plant may have grown not only on the island of Hainan but also on the mainland over an area of many hundreds of square miles. De Candolle's investigations of the origin of the tea plant seemingly

left him wallowing in a slough of doubt, and he expresses no sharp, crisp, clear opinion on the subject. In "Origin of Cultivated Plants" he says: "The seeds of the tea plant often sow themselves beyond the limits of cultivation, thereby inspiring doubt among botanists as to the wild nature of the plants encountered here and there. Thunberg believed the species to be wild in Japan, but Franchet and Savatier absolutely deny this. Fortune, who has so carefully examined the cultivation of tea in China, does not speak of the wild plant. Fontanier says that the tea plant grows wild abundantly in Manchuria. It is probable that it exists in the mountainous districts of Southeastern China, where naturalists have not yet penetrated. Loureiro says that it is found both cultivated and uncultivated in Cochin China. What is more certain is that English travelers gathered specimens in Upper Assam and in the province of Cachar, so that the tea plant must be wild in the mountainous region which separates the plains of India from those of China; but the use of the leaves was not formerly known in India."

According to Breitschneider, tea is mentioned in a Chinese work, the "Pentsao," about 2700 B.C., the period that marks the beginnings of Chinese history, and again in the "Rye," about 600 or 300 B.C. On the other hand, there is some evidence that the use and cultivation of tea was introduced into China proper from Corea during the fourth century A.D. From that period forward the history of the plant in China may be clearly traced. Tea cultivation in Japan began during the ninth century. Until the last century these two countries grew all the tea produced and even at the present day they grow by far the larger part of the world's supply. Hindustan, Farther India and the nearby islands are the only places whose teas have regularly entered the markets in competition with the Chinese and Japanese teas. Systematic tea culture on an extended scale in India began about 1836, and since that time the Indian product has steadily increased in quantity. The rapid growth of tea culture in that country began about 1870, when the crop amounted to 3,000,000 pounds. By 1878 it had reached 37,000,000 pounds, and by 1880 the estimated crop was 78,000,000 pounds.

In Natal the plant is successfully cultivated and the acreage is being increased from year to year. In a recently published paper a Natal citizen expresses the opinion that his country will soon

become a competitor in the world's tea market. The whole product of that country is now consumed at home. On some of the Natal plantations the labor is done by Hindustanese coolies imported for the purpose.

In Brazil, tea has been successfully cultivated for many years. The tea product, helped out by the use of considerable yerba maté, fills a very large part of the Brazilian demand for this kind of beverage. In France, Madeira, Mexico, Florida and California the plant is cultivated to a small extent, but as yet the product of these localities has little importance. Experiments in South Carolina have been of sufficient importance to attract the attention and aid of our Department of Agriculture. In the year book of the Department for 1901, the Secretary makes the following statement: "The production of several kinds of tea in the United States is now an assured fact, and in addition to this it is encouraging to be able to announce that experts who have examined the tea produced here this year pronounce it equal in flavor and aroma to the best imported teas. As pointed out in my previous report, the profit in this crop averages from $30 to $40 per acre net. During the year Dr. Chas. U. Shepard, of Summerville, S. C., has been in charge of the government work, conducting it in connection with his large tea gardens at the place mentioned. This year Dr. Shepard produced about 4,500 pounds of high-grade tea, for all of which a ready market was found in the North." The value of our tea imports justifies the Secretary of Agriculture in promising that "the extension of the industry in the South, and studies for the purpose of improving the quality of tea will be pushed as rapidly as the moneys at hand will permit."

There is little difficulty in getting the plants to grow and thrive in tropical, subtropical or even moderately cold climates. A real or supposed lowering of quality in the prepared leaf has been the main drawback to a general cultivation of tea in many parts of the world, but it is a question whether this lowering of quality is not due to lack of skill in curing rather than to any deficiency in the leaf itself. The South Carolina experiments have practically proved that tea of high-grade can be grown in that region. Corn, coffee, wheat, potatoes, tomatoes, tobacco and many other plants, some animals and the Caucasian race itself, have done better in localities far removed from their native habitats than at home, but, until quite recently, at least, the tea plant has been regarded as a home-lover,

and on that account capital has been backward in extending financial aid to the introduction of tea culture.

Tea first came to England in small quantities as presents to persons in high station. The regular importation of the article began about 1656–1673. The prices ran very high, ranging from $25 to $50 per pound. Heavy import duties, and internal duties levied upon each gallon of the drink itself helped to make still more expensive an already costly material. Great Britain and the United States are the greatest tea consumers outside of the tea countries of Southeastern Asia. In 1901 we consumed 1·14 pounds of tea per capita, and 10·6 pounds of coffee per capita. Several reasons account for the great difference in the quantity used—tea costs more, goes much further, is used generally at but one of the daily meals, and as it is less liked a second or third cup is less frequently called for. It is more generally denied children, and there are fewer consumers, even among adults. While both tea and coffee have to compete to a certain extent with wines and other alcoholic liquors it is upon the former that the competition makes the greater inroads. Coffee practically rules the early part of the day, but the afternoon and early evening, the times at which tea is chiefly used, find wines upon many tables. It is also true that at formal dinners, especially among men, a cup of coffee usually finishes the meal.

IV. CULTIVATION.

The plant is universally propagated from seeds. These are often planted in nurseries and the young plants set out from time to time at the places where they are needed, or three or four seeds are planted at the spot where a plant is wanted. The arrangement is in rows like the rows in a cornfield, with alleys running at right angles, or like a series of hedges with alleys running lengthwise only. The rows are kept from 3 to 4 feet apart. At a little distance the plantation looks like a field of currant or gooseberry bushes. The main stems are pruned near the top in order to keep the plants from making tall growth and to cause branching. General pruning and the pinching off of the succulent ends of the small twigs, in order to obtain the two young leaves near the end, encourages a plentiful growth of new twigs which, later in the season, give another "flush," *i. e.*, each little branch puts out five or six leaves suitable for picking. Each picking, therefore, prepares the way for

another picking, and in some tea districts the flushes follow each other at such short intervals that the picking is nearly continuous from the beginning to the end of the season. In other districts there are but three, four or five flushes during the season. At the end of the third year the bushes are large enough to allow of the first picking without injury to the plant. At about the eighth year the plant is cut down to the ground, and a number of new shoots spring up from the old roots. This cutting down is repeated at intervals whenever the crop of leaves becomes scanty, until about the thirtieth or thirty-fifth year. The plant is then replaced by a new one.

As a rule the plantations are small and are owned or worked by individual farmers. Those in China are preferably on the hillsides which have a southern exposure. Many of the hills so used are very steep, having a slope of as much as 65°. But the cultivation of tea is by no means confined to the hillsides. There are many plantations in China, and especially in Japan, and also elsewhere, that are located on level grounds. The more sparsely settled the region in which the plantation is located the better the quality of the tea. In densely populated districts, smoke and dust, and other kinds of dirt which are always abundant, settle upon the leaves and lower the quality.

V. PREPARATION FOR MARKET.

Picking.—The time of first picking, the number of pickings during the season and the time of last picking vary in different parts of the tea district. In Ceylon and parts of India the picking begins usually in March and there are often as many as twenty-five pickings during the season which continues until October or even later. In China the pickings begin in April and vary in number with the latitude and altitude. In Japan the picking begins late in April or early in May and the first crop gathered is the famous hyson quality. In that country there are not generally more than four or five pickings during the season. In all tea countries the early pickings make the finest qualities of tea. Late in the season the leaves become tough and less succulent and the twig becomes more woody. Leaves gathered then yield a very inferior grade, which is not usually exported, but is used by the peasants of the poorer districts. Although the expense of the primitive methods of transportation

to exporting points, the cost of curing and the commissions to the various dealers through whose hands the tea passes before it reaches the consumer, are the chief elements in making tea costly, the expense of picking is by no means inconsiderable. For the finest qualities each leaf is separately picked. For less fine qualities the end of the twig with the bud and one or two leaves is pinched off. In many of the teas in our markets these twig ends may be seen. For indifferent qualities the twig is pinched off further down, and the fanning and sieving, after the curing is complete, must do the whole work of sorting. Tea would be somewhat cheaper if it were practicable to take a branch in the hand and by one motion strip off all the leaves. But this would involve injury to the plant by removing too much foliage; would strip off or injure the buds that must be depended upon to start the twigs for future crops; would break the leaves and thus cause a general mixing of qualities and a greater amount of tea-dust, and would take all of the stalk of each leaf, thus lowering still further the quality of the product. Most fine teas if softened in water will show that the leaves were pinched off near the base, leaving the stalk on the bush.

Other things being equal, the time of picking and the position of the leaf on the twig determine the quality of the tea. Generally but three or four leaves nearest the end of the twig are taken. If the partly opened bud almost at the end be taken it is called flowery pekoe; the next leaf is orange pekoe; the third is pekoe; the fourth is first souchong; the fifth is second souchong; the sixth is congou; the seventh is bohea. A mixture of the first, second and third is called pekoe; a mixture of the first five is pekoe souchong, and there are various other mixtures.

Curing.—There are many varieties of tea known to commerce. Many of these differ in quality and many in trade-mark only. Some, as we have seen, owe their names to the position of the leaf on the bush, others to the geographic sources from which they come, others to the time of picking or to the shape given the prepared leaf, as in the case of the gunpowder and imperial teas. But practically all teas are classed as green or black, no matter what other circumstance may make them pekoe, souchong, hyson, imperial, etc. The method of curing determines whether the tea shall be green or black. The agricultural variety of the plant from which the leaves were gathered does not determine the color of the prepared leaf,

although it is true that some varieties are preferred for the black and others for the green. So far as I can determine, quick drying without fermentation gives green tea; slow drying with fermentation gives black tea. We see this principle involved in drying plants for the herbarium. If rapidly dried they remain green. If slowly dried they discolor, become brownish, and, if fermentation takes place, they turn black. Even with the flowers—quick drying tends to preserve the natural colors, while slow drying causes them to change color.

Green Tea.—The leaves, as soon as brought from the garden, are spread out for a short time until they wilt. They are placed in pans over a charcoal fire for rapid withering. During this process they are kept in motion by tumbling them about with the fingers. In the five or eight minutes of this roasting they lose a large part of their moisture which is driven off as a vapor and they become quite flaccid. They are then rolled by hand upon a table and each couple of handfuls is then made up into a compact ball. The rolling and balling give the curl and twist so noticeable in the tea as we know it. They are allowed to remain in the balls for a brief space of time to help set the twist, but not long enough to permit of any fermentation. They are then placed again in the firing-pan and dried as quickly and as thoroughly as possible. Often the leaves are given two roastings and rollings before the final drying. During the rolling process the leaves which are oversize, or of bad color or otherwise inferior, are put to one side and used for making low-grade tea. After the leaves are thoroughly dried they are placed in the hopper of a fanning machine, consisting of wooden paddles turning in a circular wooden box and having an outlet through which a current of air may strike the tea as it falls from the hopper. The current drives the dust and lighter particles of tea to a distance and roughly assorts the leaves as to weight and size. The final sorting is done by passing the tea through bamboo or wire sieves of varying mesh. It is then packed in zinc-lined boxes. The finest grades are sometimes packed in large pewter jars, ingeniously contrived to exclude air, and yet permit of easily reaching the contents by merely drawing out the stopper.

Black Tea.—After the leaves are gathered they are spread in the sun for thorough wilting. They are allowed to remain thus for several hours, except that they are occasionally tumbled about to

prevent heating, which, at this stage, is undesirable. When they are completely wilted they are placed in heaps for about an hour, during which time they become soft and moist and undergo a slight change of color. They are then put in the roasting pan for a few minutes roasting. They go then to the rolling and balling table. The balls are placed on bamboo trays and stood in the sunlight for an hour's fermentation. The balls are then broken apart and the leaves separated from each other and spread out in thin layers in the sun. When first spread the leaves are partly greenish, partly yellowish and partly blackish; but at the end of two or three hours they become uniformly blackish. They are then ready for the second roasting and rolling, and after that for the drying or firing. This and the subsequent operations are about the same as in the case of green tea, except that the black tea is usually given three or four firings and the firing is done in network receptacles.

While the principles involved are always the same there are many variations in the above-described processes. They lead to supposed or actual differences in the resulting product. For instance, if the wilting be done by artificial heat the tea will have a greenish tinge. There is said to be a relation between the amount of twist in the leaf and the strength of the infusion made from the leaf. Well-twisted tea, which is well-rolled tea, gives the stronger infusion. This is possibly due to the fact that when the leaves are thoroughly rolled the juice is squeezed out and is then mopped up again, and this is repeated several times, having most likely some effect in making the leaves yield up their good qualities while infusing.

Robert Fortune, who made an extended trip through the Chinese tea districts in the interests of the East India Company and who, in 1849, successfully introduced 12,000 tea plants to the company's plantations in the Northwest provinces by the novel method of planting the seeds in boxes at the beginning of the journey, in order that they might be sprouted on reaching their destination, carefully observed the preparation of both the black and green teas. He summarizes his description of the processes as follows:

"It will be remarked, then, with reference to green tea: (1) that the leaves are roasted almost immediately after they are gathered; and (2) that they are dried off quickly after the rolling process. * * * It will be remarked, therefore, with reference to the leaves which are to be converted into black tea: (1) that they are

allowed to lie for a time spread out in the factory after being gathered and before they are roasted; (2) that they are tossed about until they become soft and flaccid, and then left in heaps, and that this also is done before they are roasted; (3) that after being roasted for a few minutes and rolled, they are exposed for some hours to the air in a soft and moist state; and (4) that they are at last dried slowly over charcoal fires. The differences in the manufacture of black and green teas are therefore most marked, and I think fully account for the difference in color, as well as for the effect produced on some constitutions by green tea, such as nervous irritability, sleeplessness, etc."

VI. CHEMISTRY.

As in the case of coffee, the taste of tea is principally due to an essential oil and to tannic compounds. The oil is not present in the fresh leaf, but develops in the curing process to the extent of ·75 per cent. of the weight of the dried leaves. In theine, tannic compounds and essential oil, the tea-leaf is much richer than the coffee bean. It is by these three constituents that the beverage materials are usually compared from a chemical point of view. The differences between tea and coffee are shown in the following table of analyses:

	Tea, per cent.	Coffee, per cent.
Water	5 "	12 "
Theine	3 "	1·75 "
Caseine	15 "	13 "
Gum	18 "	9 "
Sugar	3 "	6·5 "
Starch	trace	trace
Tannin	26·25 "	4 "
Aromatic oil	0·75 "	0·002 "
Fat	4 "	12 "
Fibre	20 "	35 "
Mineral	5 "	6·7 "

Such analyses are only partially satisfying. It should be remembered that it requires five or six times more coffee to make a cup of coffee than of tea to mak a cup of tea. Hence, in determining the amount of theine and tannin taken into the stomach with these beverages, the liquors themselves, and not the beans and leaves, should be subjected to analysis.

In the following table black and green tea are compared:

MULDER'S ANALYSIS.

	Black tea, per cent.	Green tea, per cent.
Essential oil	0·60 "	0·79 "
Chlorophyll	1·84 "	2·22 "
Wax	0·00 "	0·28 "
Resin	3·64 "	2·22 "
Gum	7·28 "	8·56 "
Tannin	12·88 "	17·80 "
Theine	0·46 "	0·43 "
Extractives	21·36 "	22·80 "
Coloring substances	19·19 "	23·60 "
Albumen	2·80 "	3·00 "
Fibre	28·33 "	17·80 "
Ash	5·24 "	5·56 "

Blythe considers the above trustworthy in all except the percentage of theine. Other analysts have uniformly found a higher percentage. Dragendoff in three analyses of green tea found the theine to be 1·61, 1·66 and 1·82 per cent. In six analyses of black tea the theine varied from 1·36 per cent. to 2·14 per cent. In three high-grade flower teas consisting of young leaves without buds he found the percentages to be 2·02, 2·68 and 3·09.

Tea does not class as a food but as a food adjunct. Its chief food-value lies in the fact that it retards waste of tissue. But the leaves are rich in nitrogenous compounds, and when the beverage is prepared in such a way as to make these compounds available, tea may be classed as a true food. As bearing upon the food-value the following is quoted from Chambers' Encyclopedia: "The nitrogenous compound allied to caseine or gluten constitutes about 15 per cent. of the weight of the leaf. As hot water extracts very little of this substance, a large quantity of this nutritious matter, which forms about 28 per cent. of the dried spent leaves, is thrown away. Much of it might be dissolved if a little carbonate of soda were added to the boiling water with which the tea is made; and in the brick tea (the refuse and decayed leaves and twigs pressed into molds) used by the Tartars, most of this substance is utilized. They reduce the tea to powder, and boil it with the alkaline water of the Steppes, to which salt and fat have been added. Of this decoction they drink from twenty to forty cups a day, mixing it first with milk, butter and a little roasted meal. But without the meal, mixed only with a little milk, they can subsist for weeks on this thin fluid food." A Chinese author tells not only the kind of water

that should be used but also how it should be boiled—"that from springs in the hills is said to be the best, and river water next, while well water is the worst." His directions are quaint and amusing, but perhaps worthy of consideration, for a Chinaman usually knows something worth knowing about making tea. Then, too, our own choice of the kind of water to be used in the wash-bowl and laundry shows that the kind of water used in making tea may be of importance.

VII. EFFECTS.

As to the effects of tea upon the human system, it seems that it is best for every man to be his own judge. Both professional and popular opinion are liable to be warped—the former by the knowledge that tea contains some principles which ought to have bad effects, and the latter by a prejudice springing from a liking for the beverage and from its every-day use. As with the use of many other things, those who use it in moderation are best fitted to pass opinion, and in the great majority of cases that opinion, whether it be from the physician or the layman, will be that the effects are mostly temporary and usually beneficial. Most of us have experienced the refreshing effects of tea when a day of unusual strain has made demands which have depleted the store of physical and mental energy. While these effects are but temporary, they for the time bolster up the flagging spirits, thus giving the physical being time to make repairs free from the retarding influences of a fretful mind. When the physical nature reports all well, the mental nature is not disposed to complain of conditions within or without. This should not be considered as parallel to the "Dutch courage" that comes from the use of alcoholic liquors, opium, morphia, etc., because the tea has no evil after-effects. Its use on such occasions is rather a means of setting in order a disordered house.

The effects are mostly due to the theine, the tannic compounds and the warmth or coldness of the infusion. Green tea has a larger percentage of tannin, and this probably accounts for its greater effect. The theine has the property of lessening the waste of tissue. This has been determined by observing the amount of waste tissue in urine. It has been thought that this lessening of waste should permit of the same amount of exertion on a lessened diet. Experience seems to confirm the truth of this in the case of coffee, tea

yerba maté, guarana and kola, all of which contain theine, and also in the case of cocoa containing a similar alkaloid—theobromine. The theine acts also as a mild cardiac stimulant. The tannin being astringent tends slightly to cause constipation. Medical writers differ in their opinions of the value of tea, some regarding it as the source of various nervous complaints, while others recommend it as a daily drink, and as a medicine in cases of rheumatism, nervous headache, fevers, etc.

The effects of inordinate use of tea are said to be frightful, but, fortunately, such use in this country is not of frequent occurrence.

VIII. SOCIAL STATUS.

Much might be written about the social status of the table beverages, or what might be called the psychologic elements in their use. Cocoa is a dainty, a sort of liquid confection; coffee is largely utilitarian; tea is, in great measure, a handmaiden of fashion and refinement. In a great number of cases the liking for tea is not natural but acquired. In this respect it differs from cocoa and coffee. Nearly every child likes cocoa from the very first sip, and but few of them do not like coffee. Children like to imitate their elders, and are prone to feel aggrieved if denied anything that usually forms part of the meal. Very often when denied tea they are placated and made to feel "big" by giving them the mixture of hot water and milk, called cambric tea. Later, in response to their more urgent demands for equal rights, or just for the fun of it, a teaspoonful of real tea is added. This naturally leads to increasing the quantity and frequency of the true tea until cambric tea becomes a mere memory of little childhood, and the regular use of tea marks one of the steps in the transition from the bib to the napkin.

In the liking for tea the female palate differs from the male, and, as Talmage has said, "the bottle rules the sensual world, but the teacup is queen in all the fair dominions." Coffee and cocoa decline to compete with wine to loosen the male tongue, or with tea to set the tongues of the ladies into a canter. If we should change the line of the popular song to read, "Polly, put the kettle on, and we'll all take coffee," it would be something like the factory whistle at noon, which tells us to knock off, fill up and be quick about it. But if we say, "Polly, put the the kettle on, and we'll all take tea," we feel a poetic force in the line. It helps to show that tea is a sociable

sort of beverage, the mere mention of which transports the imagination into a realm of things dear to the heart. The third meal of the day—the family meal, the sociable meal—is often called tea.

IX. SUBSTITUTES.

Tea or a similar hot decoction is used in nearly all parts of the world, by savage as well as by civilized man. In the parts of the world where tea and coffee have become known, substitutes which do not contain theine are rarely used except when the theine-containing products are denied through stress of poverty, embargo in war time, or some other circumstance. During the American Revolution our people used New Jersey tea, not because they preferred it, but because tea and coffee were unobtainable. The substitutes for tea divide into two classes—those which contain theine, and those which do not. The most important of those containing theine is yerba maté or South American tea or Paraguay tea, made of the toasted leaves of several species of holly growing in Paraguay, Northern Argentina and Southern Brazil. It is the principal drink in a large part of that region.

Coffee-tea or Sumatra tea is made of the toasted leaves of the coffee-tree, which are said to contain a larger percentage of theine than do the beans themselves. The natives of Sumatra prefer the leaf to the bean because it contains more bitter principle and is more nutritious. In the Sumatran lowlands the coffee-tree is grown for the leaf instead of the berry, because in that region it does not yield good quantities of the latter.

Kola and guarana also contain theine, and are used in infusions; the former being used as a masticatory, also.

A great number of plants which do not not contain theine are used as substitutes. In North America the principal substitutes have been Labrador or James's tea (*Ledum palustre and L. latifolium*—Ericaceæ); mountain tea from the creeping wintergreen, checkerberry or partridge-berry (*Gaultheria procumbens*—Ericaceæ); Oswego tea (*Monarda didyma*—Labiatæ); New Jersey tea (*Ceanothus americanus*—Rhamnaceæ), and the famous Appalachian tea, or black drink of the North Carolina Indians, made from the leaves of the cassena or yaupon (*Ilex cassine*—Aquifoliaceæ), made also from the dahoon holly (*Ilex dahoon*), and the inkberry (*Prinos glaber*—Aquifoliaceæ), and the withe-rod (*Viburnum cassinoides*—Caprifoliaceæ).

Johnston ("Chemistry of Common Life") gives a list of thirty-five plants used in various parts of the world as tea substitutes, and the list is by no means complete. Even in China and Japan substitutes are in use. In the former country the leaves of *Sagaretia theezans* are so used by the poor classes; and in Japan the leaves of *Hydrangea thunbergii* are used for making the Ama tsja or tea of heaven.

X. ADULTERANTS.

The adulteration of tea is of two kinds: (1) coloring; (2) mixing leaves of other plants with the true tea. Small quantities of prussian blue and soapstone or gypsum are used for brightening the color of some green teas. The coloring is done by heating the tea in the firing pans, throwing in the quantity of coloring matter to be used, and mixing the whole thoroughly by a raking action of the fingers. As to the use of other leaves, it may be said that they can be prepared in such a way as to be practically undistinguishable when mixed with the true article, except to the expert. In infusion, however, the characters of the various leaves become apparent as soon as the leaves soften and spread out, and one knowing the appearance of the tea-leaf should be able to distinguish it from other kinds of leaves used as adulterants. It is generally conceded that at the present time in this country there is but little adulteration by mixing other leaves with the tea. Chemistry, the microscope and the appearance and taste of the infusion are the means for detecting adulteration. To expert tasters the infusion is sufficient not only for this purpose but also for grading teas as to the prices to be asked for them, and the opinions of different tasters on a given lot of teas of varying grades will be found to be remarkably uniform.

XI. COMMERCE.

GROSS IMPORTS OF TEA FOR YEAR ENDING JUNE 30, 1902.

From.	Pounds.		Av. Price.
Chinese Empire	35,998,219	$3,737,941	$0 10·4
Japan	30,753,505	4,183,773	13·6
East Indies	2,897,870	396,860	13·7
Other Asia and Oceania	328,152	41,178	12·5
United Kingdom	3,740,100	704,772	19·0
British North America	1,853,319	323,400	17·4
Other countries	7,960	2,204	27·7

IMPORTS, AVERAGE PRICE AND PER CAPITA CONSUMPTION OF TEA IN THE UNITED STATES DURING CERTAIN YEARS, 1850–1901.

Year Ending June 30th.	Net Imports. Pounds.	Net Imports. Dollars.	Average Price.	Per Capita Consumption Pounds.
1850	28,199,591	$3,382,054	$0 14·1	1·22
1855	19,763,593	4,937,610	25	73
1860	26,326,928	6,910,124	26·3	84
1865	16,849,189	3,043,933	18·1	49
1870	42,540,471	12,489,217	29·4	1·10
1875	63,291,304	21,959,518	34·7	1·44
1880	69,894,769	18,983,368	27·4	1·39
1885	66,374,365	13,135,782	19·5	1·18
1890	83,494,956	12,219,643	15	1·33
1895	96,437,042	12,979,868	13·5	1·38
1900	83,303,177	10,325,987	12·4	1·09
1901	88,502,554	10,865,238	12·3	1·14
COFFEE.				
1901	809,036,029	$58,681,620	7·3	10·60

CORRESPONDENCE.

UNIFICATION OF FORMULÆ.

To the Editor AMERICAN JOURNAL OF PHARMACY:

I read carefully, and with the greatest interest, the tabulation of various international standards of remedies now official in leading national pharmacopœias, and would state that it is a matter for serious thought and consideration.

I have always been an advocate of uniformity and accuracy wherever possible, and certainly this matter commends itself to all on the most practical grounds.

Every merchant in good standing, of whatever nationality, is perfectly familiar with the dollar, pound sterling, franc and mark, or their equivalents; but are we, as pharmacists, as familiar as we should be with foreign national standards?

I, for one, must admit the truth: I had no idea of so great a variation, and I take this opportunity to personally thank the writer for

so valuable a paper; for I know and appreciate the labor of such a task.

While on this subject, I would state I am a confirmed advocate of the decimal system, and greatly favor expressing formulæ by percentage only and not by specific weights.

Our duty is not done by simply being pleased; but this international tabulation, and any other literature bearing upon the subject that will lead to uniformity of standard, should be placed in the hands of every thinking pharmacist—it is too valuable to be hid under a bushel.

Steam and electricity are bringing the people so nearly together commercially and socially; and why not in so grave a matter as unification of formulæ of *all* medicaments? Let us all take a hand and push the matter. It must come, and why not now?

ALLEN SHRYOCK, PH.G.

PHILADELPHIA.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

HANDKOMMENTAR ZUM ARZNEIBUCH FUR DAS DEUTSCHE REICH (Vierte Ausgabe) Bearbeitet von Dr. Alfred Schneider und Dr. Paul Süss. Göttingen, Vandenhoeck und Ruprecht. 1902.

This, the third edition of this exhaustive work, is now available in its completed form. Some of the early parts of the book have been referred to in this JOURNAL (1902, page 85). The complete work is, however, worthy of a special notice.

The book consists of 1,140 pages, large octavo, and is well printed on a good quality of paper.

Following a short preface, we find an introduction of 63 pages containing a general description of the tests, reagents and methods of applying them to the drugs and chemicals of the Pharmacopœia. Succeeding this, we have 1,017 pages containing the text and comments on the Pharmacopœia proper. The arrangement of this matter is rather interesting, and also very satisfactory, in that it gives a clear distinction between what is official, or belongs to the Pharmacopœial description, and what is comment.

To prevent any possible misunderstanding, the official portion is in the German script, similar to that used in the Pharmacopœia

itself, while the comments are uniformly in Latin script, making a sharp distinction between the two.

That these accompanying comments are not alone exhaustive, but also of a correspondingly high scientific standard, is assured by the reputation and attainments of the editors and their collaborators. At the close of the commentary portion we find the various tables that are included in the German Pharmacopœia, including the table of maximum doses, and the lists of drugs and preparations that are to be carefully kept, and those that are to be very carefully separated from other medicinal preparations.

In addition to this we find an appendix containing additions and corrections that are likely to arise with a work that has been nearly two years in process of publication.

There is also a very complete and exhaustive index, covering 24 three-column pages.

Altogether the book would appear to bear out the claim that is made for it in the German pharmaceutical journals, that "it is generally acknowledged to be the most exhaustive and also the most complete commentary on the latest edition of the German Pharmacopœia." M. I. W.

A Course in Botany and Pharmacognosy. By Henry Kraemer, Ph.B., Ph.D., Professor of Botany and Pharmacognosy, and Director of the Microscopical Laboratory in the Philadelphia College of Pharmacy. Illustrated with plates from original drawings by the author. Philadelphia, 1902: 8vo, 384 pages. Cloth, $3.50. G. E. Stechert, agent, 9 East Sixteenth Street, New York City.

For some time rumors have been rife that at least one new American text-book on botany and pharmacognosy and related subjects would make its appearance almost simultaneously with the new edition of the United States Pharmacopœia, consequently, those most concerned in these subjects have been looking forward to its appearance with interest. The author, having been a successful teacher of botany and pharmacognosy for many years—having published elaborate researches in these branches of science—and being chairman of the Sub-committee on Botany and Pharmacognosy of the Committee for the Revision of the United States Pharmacopœia, is eminently qualified as an authoritative writer.

This new book is about the size of the familiar text-book of

Maisch, and contains 380 pages of text. The subject-matter is divided into four parts, as follows: Part I, 98 pages, Plant Morphology; Part II, 214 pages, Pharmacognosy; Part III, Reagents; Part IV, Illustrations and Index.

As stated in the preface, the subject of morphology, both outer and inner, is more or less extensively treated, because this knowledge is of fundamental importance in the study of vegetable drugs, crude and powdered. There are many treatises upon this subject, but the great difficulty is that they have not been adapted to the needs of the pharmacy student. Either they are burdened with multitudinous technical details unimportant from his point of view, or they are wofully superficial. A happy medium has been struck in this text, especially when we consider that the author elucidates the subject by illustrated lectures. To some, the absence of illustrative cuts along with definitions will be considered an objection as a book for general use. A very serviceable feature is the plan of emphasizing special or subtopics by means of conspicuous heavy-faced type.

The introduction to Part II defines pharmacognosy, and very concisely and clearly explains the meaning of the terms—natural origin, botanical origin and habitat of plants; official title, pharmacopœial definition and commercial origin of vegetable drugs, and generalizes upon the collection, drying, preservation, garbling and valuation of drugs.

The classification adopted by the author is the morphological, viz.: seeds are considered together, then the roots and rhizomes, and so on with the rest of the plant organs in a natural sequence. A very concise key or classification precedes the actual discussion of each group of plant organs; in fact, this part is very similar to the plan of Maisch. There are, however, no illustrations in the text, the constituents are not so fully treated, and the properties of the drugs are omitted entirely. With reference to chemical constituents given with each drug, the disproved statements have been eliminated and the results of latest research incorporated. In a very few instances, however, it is noticed that the most important constituents are omitted, as, for example, in oil of fennel, oil of caraway and oil of coriander, while in some relatively unimportant drugs, as staphisagria, the constituents are given in considerable detail. It is not surprising that the constituents of sanguinaria are not correctly

stated when we consider the confusion in nomenclature that exists in literature.

The chapter on powdered drugs embodies the author's own labors upon 208 drug powders. The results were presented in the form of a paper at a meeting of the American Pharmaceutical Association and later published in pharmacy journals, so that it is well known. For this reason, additional comment upon its merits is at this time unnecessary.

Part III is devoted to a discussion of reagents and their uses, and Part IV to 128 pen-and-ink drawings by the author, illustrative of the text. The drawings are reproduced upon a fine grade of glazed paper and are of superior excellence. There is only one drawing that is not representative, viz.: eighty-seven of the lupulin glandular hairs. The otherwise beautiful plates are somewhat marred by the lack of uniformity in lettering and numbering, which is rather crude and unfinished.

This book is certainly a very considerable contribution to the literature of pharmacognosy in America, and is probably the first to take up seriously and extensively the subject of the identification of drug powders. It must be borne in mind, however, that the most satisfactory results are only to be obtained by using it in connection with lecture and laboratory work.

The mechanical part of the book and general make-up is not the equal of the contents. The writer's copy is not well bound and would not stand the wear that a student would give it. The paper is of excellent quality, its rough surface, though, in the mind of the writer, not being practical in a book that will be handled as much as this will be. Very few errors were noticed, showing very careful proof-reading.

Every pharmacist, whether student, clerk or proprietor, ought to experience a feeling of satisfaction in the possession of this work.

J. O. SCHLOTTERBECK.

PHARMACEUTICAL MEETING.

The regular monthly meeting of the Philadelphia College of Pharmacy was held Tuesday, January 20th, Mr. C. W. Hancock, a member of the College, acting as chairman.

The first paper on the program, entitled "What druggists can do

to assist in detecting cases of poisoning" (see page 51), was read by Dr. Henry Leffmann, the well-known chemical and sanitary expert. In discussing the paper, Professor Remington commended it very highly, and referred to several cases of ptomain poisoning, and said that he had no doubt that a large number of cases of poisoning were due to the development of poisonous principles resulting from the decomposition of animal matter. Professor Lowe said that alcohol was not efficient as an antidote to carbolic-acid poisoning when the latter entered the system, and that the employment of some of the soluble sulphates, *e. g.*, magnesium sulphate, was useful in this connection. Dr. Leffmann said, that next to illuminating gas, carbolic acid was more frequently used in suicidal poisoning than any other means, and that during the past year there were nearly thirty cases of this kind in Philadelphia. He further said, that when carbolic acid entered the system it was difficult to follow it up with physiological antidotes, and that systemic remedies were indicated.

In answer to a question regarding the poisonous properties of illuminating gas, Dr. Leffmann said that the illuminating gas made by the destructive distillation of coal consisted chiefly of hydrocarbons—members of the methane and methene group, which do not possess free valencies; while water-gas contained variable amounts of carbon monoxide, the valence of which is not satisfied, and entering the blood unites with the hemaglobin forming a compound, which is not readily decomposed, and in this way it acts as a cumulative poison throwing all of the hemaglobin out of the circuit, producing a so-called chemical asphyxia. In regard to the treatment, he said that artificial respiration and the administration of oxygen were useless, and that a patient overcome by water-gas could only be resuscitated by the transfusion of new blood. Dr. Leffmann further said that he believed that many cases of slight illness were due to the inhalation of carbon monoxide in this way, and that people should be careful in seeing that the gas-pipes and fixtures were perfectly tight. Mr. Wilbert recommended that every apothecary have a stomach-tube at hand for emergency cases. In reply to a question by Mr. England in regard to the poisonous properties of methyl alcohol, Dr. Leffmann said that the action of pure methyl alcohol was a slow one, and that he believed that where blindness had been produced that possibly some creosote products

were present. Mr. Kebler said that no doubt Reinsch's test was the best for general purposes; that although Marsh's was more difficult, the former is the more delicate. He also referred to the presence of arsenic in potassium carbonate extracted from the residue of sheep washings, and said that this was probably due to the fact that the sheep were washed in arsenical dips.

M. I. Wilbert read a paper on "Why Popcorn Pops." (See page 77). Mr. LaWall called attention to the fact that pieces of the grain will pop, and showed a hybrid ear of popcorn which had been planted near yellow corn, and said that while the grains appeared to be similar in most particulars, that some popped and others did not. Mr. Kebler said that under certain conditions sweet corn would pop, but that the "yellow dent" would not pop as well as the "crowfoot." Mr. Wilbert said that field corn would pop and that the older it was the better. He also stated that in the popping of corn it was necessary that the outer cells be dry and the inner ones moist. Professor Kraemer drew a section of a corn grain and referred to the composition of the different parts of the grain and the changes which take place on the application of heat.

Professor Remington presented life-sized bust-portraits of Alfred B. Taylor and Maurice W. Alexander, and said that Mr. Wilbert had prepared short sketches of each of these men, which Mr. Wilbert then read. The portraits were pronounced very accurate likenesses, and remarks on the life and work of these men were made by Messrs. Hancock, Wiegand, Lowe, Wilbert, England and Boring. The latter offered the following motion, which was unanimously adopted:

"In view of the great services rendered to pharmacy by Alfred B. Taylor, and of the prominent part which Maurice W. Alexander took in the affairs of the American Pharmaceutical Association; and, furthermore, in view of the desirability of the Philadelphia College of Pharmacy procuring the portraits of representative men whose lives furnish interesting chapters in the history of American pharmacy, I move that a special vote of thanks be tendered to Professor Remington for presenting the portraits of these men to the college this afternoon."

Evan T. Ellis presented a paper on "The Story of a Very Old Philadelphia Drug Store," which was read by title and referred to the Committee on Publication. H. K.